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# SOLVING ANDROID IPTV VIDEO STREAMING ISSUES

1-2-3 with Globeron

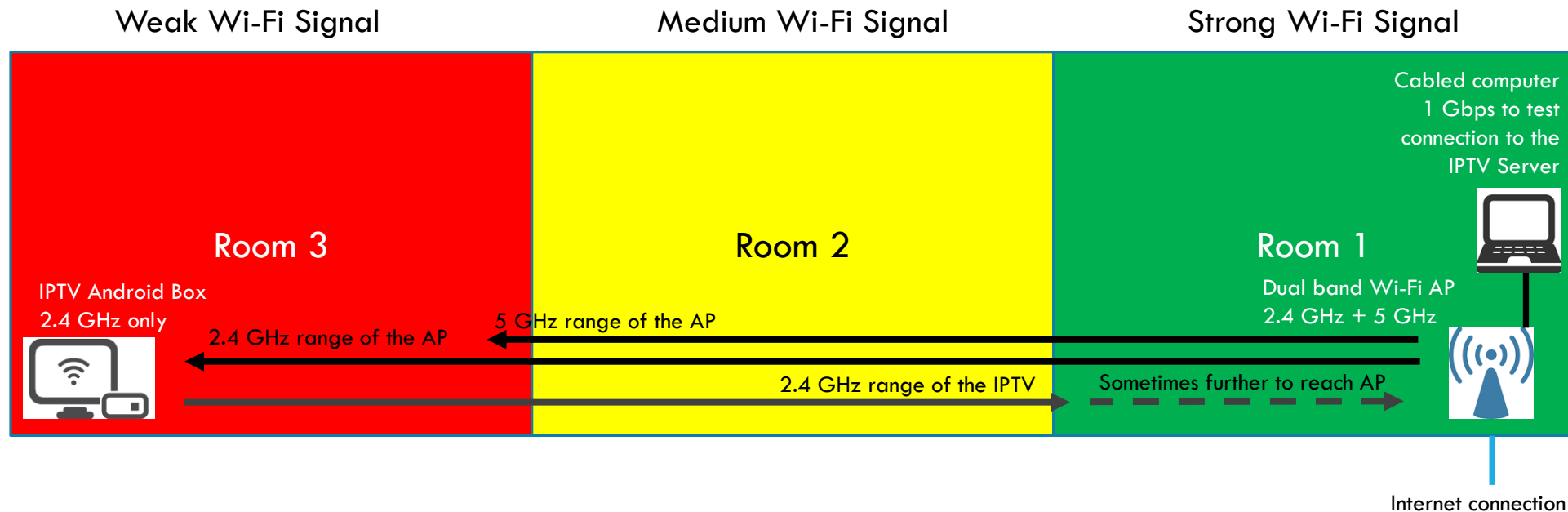


# DISCLAIMER

- Wi-Fi professionals use “enterprise level” tools, but these can be quite expensive for persons who want to troubleshoot their Wi-Fi network at their home.
- Not all tools shown in this presentation can easily be used as sometimes a special adapter (“dongle”) is required to do the particular type of analysis (e.g. Spectrum Analysis adapter or a Wi-Fi adapter in monitor mode to do protocol analysis).
- As more Internet Service Providers (ISPs) deploy internet packages including Wi-Fi Routers, Mesh routers, IPTV Android devices, etc. there is an increase of issues in residential areas or multi-tenant buildings / high density city areas
- It seems there is an increase of home users having issues with IPTV streaming devices and therefore the focus here is on solving these issues (example is Android IPTV focussed)

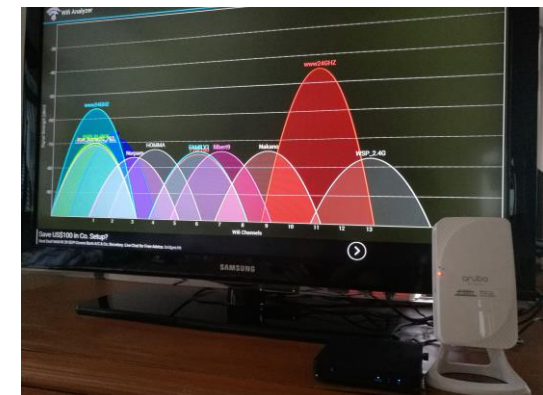
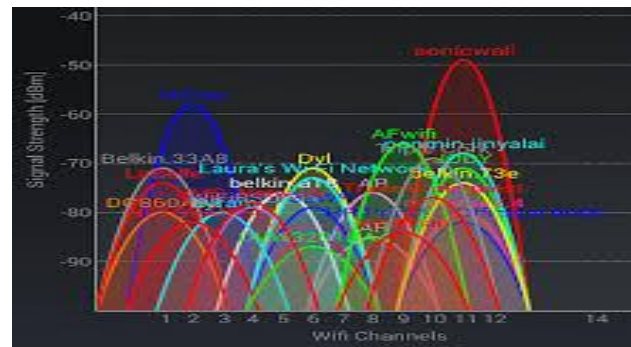
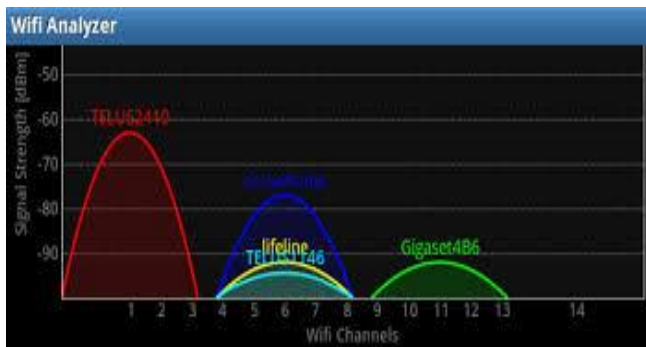
# ISSUE – IPTV VIDEO STREAMING IS NOT SMOOTH STOPS STREAMING, JITTER, DELAY

- Check the RF Signal Strength and RF Coverage in both directions
- Is there a power balance between both AP and client?
- Does the Android IPTV box only support **2.4 GHz** Wi-Fi?



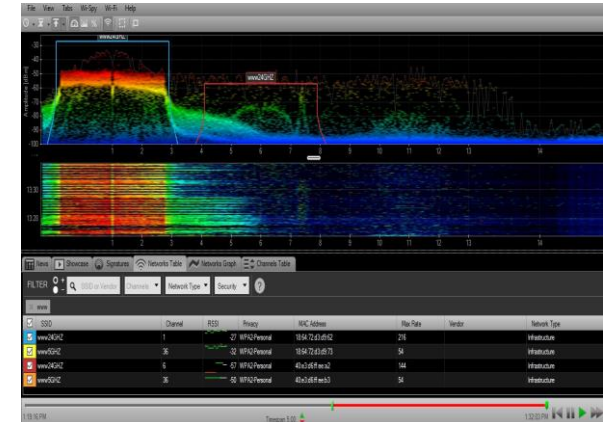
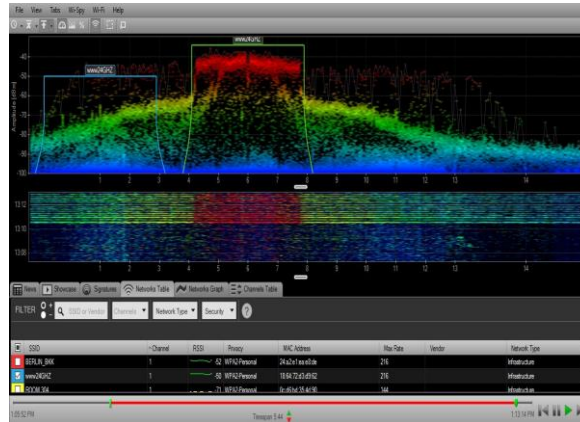
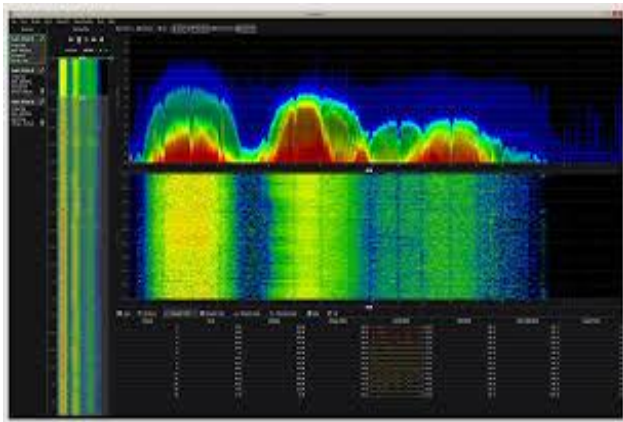
# MEASURE WITH YOUR ANDROID DEVICE THE SIGNAL STRENGTH OF THE WI-FI AP

- If the Android IPTV device supports download of Android applications install tools like Wi-Fi analyzer. Alternatively use your Android smartphone. This is needed because of the weaker transmitters and receivers + smaller antennas (less gain) used in these devices.
- View the signal strength of the Access Point (AP). The Android IPTV will typically select the configured AP with the strongest signal.
- Note that 2.4 GHz can be challenging because of too many APs on the same or overlapping channels “Co-Channel interference (CCI) and Adjacent Interference (ACI)”

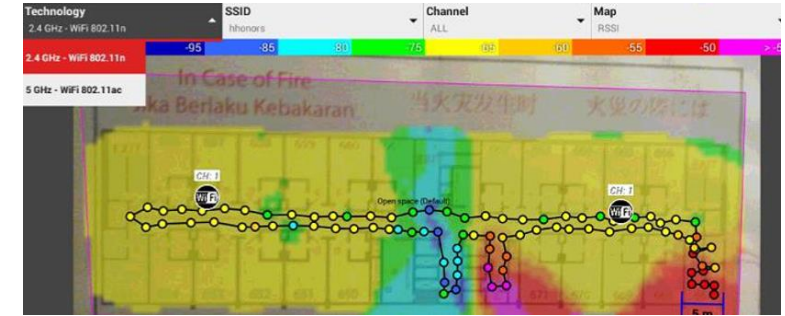


# MEASURE WITH A SPECTRUM ANALYZER SUPPORTING 2.4 GHZ AND 5 GHZ

- **Most people do not have a spectrum analyzer**, but a Spectrum Analysis need to be done for both 2.4 GHz and 5 GHz frequencies (as Wi-Fi uses both bands depending on the chipsets used), but these unlicensed frequencies are used by non-Wi-Fi devices as well (Microwave ovens, motion detectors, Cordless phones, Bluetooth, etc.)
- Understand the measurements, recognize the spectral masks/signatures and find or avoid these Wi-Fi channels that are impacted (if possible).



# VISUALIZE THE RF COVERAGE USING AN ANDROID DEVICE



On Google Play Store  
search for applications like

- Wi-Fi Heatmap
- Wi-Fi Coverage Mapper
- Wi-Fi Survey

Or evaluate enterprise level tools:



Full working demo / evaluations:

Android – iBwave Mobile Wi-Fi

<http://www.ibwave.com/software-downloads/free-trial/iBwave-WiFi-Mobile>



Android – Ekahau Mobile Survey

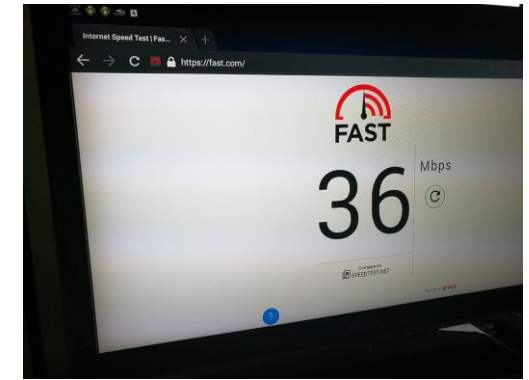
<https://www.ekahau.com/products/mobile-survey/evaluation/>



Android – Netscout AirMagnet Survey Mobile (the .apk is part of the Netscout Site Survey Pro Windows package) <http://enterprise.netscout.com/ppc/wireless-survey-wlan-design>

- **Note 1:** Android devices are different (different OS, different chipset, different antenna's, etc.). Measurements are different per device used.
- **Note 2:** Wi-Fi professionals use enterprise level Wi-Fi RF Planning and Site Survey tools, which are more accurate, but more used for large Wi-Fi network deployments.

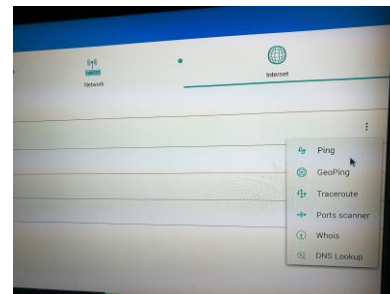
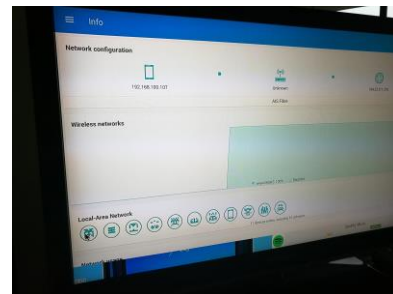
# PERFORMANCE / CONNECTIVITY TEST



If your IPTV device supports a web-browser try to go to websites like “Fast.com” to do a speed-test or if the IPTV can install Android applications try “Speedtest.net”

Do some “ping” and “traceroute” tests with tools like “HE Network Tools” to understand the delay and number of hops between the device and the rest of the network.

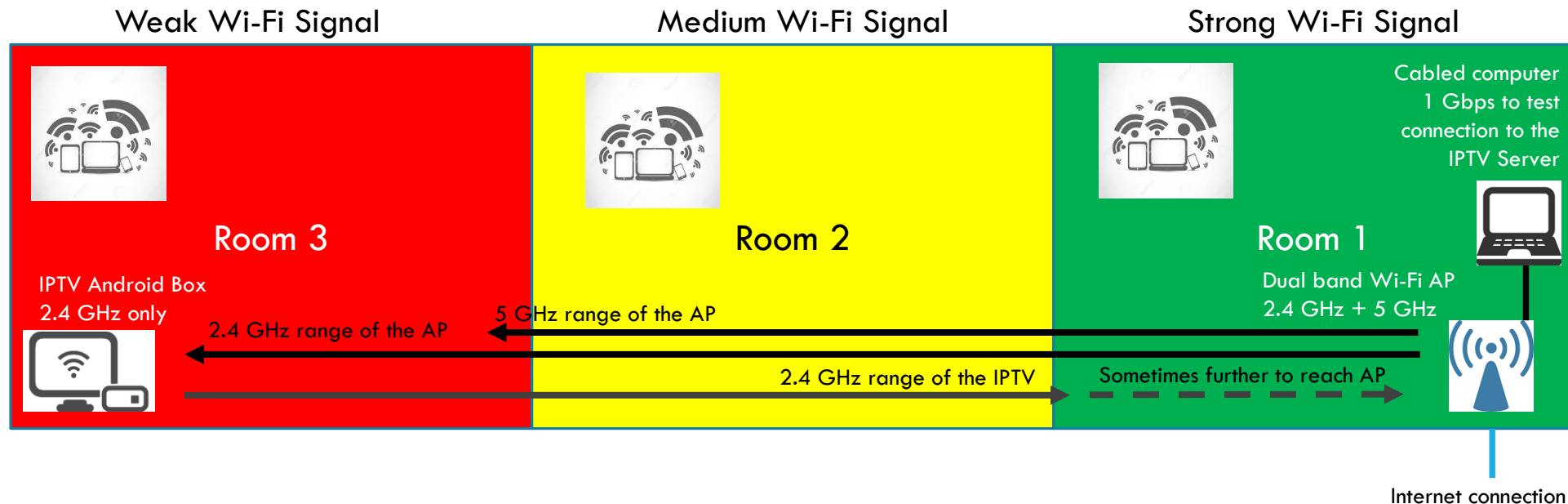
Try to do an end-to-end test from the IPTV device to the server where the TV channels are hosted (you might need to ask your service provider for details of the IP-address of the server)





# OTHER WI-FI DEVICES ON THE SAME AP OR NETWORK ?

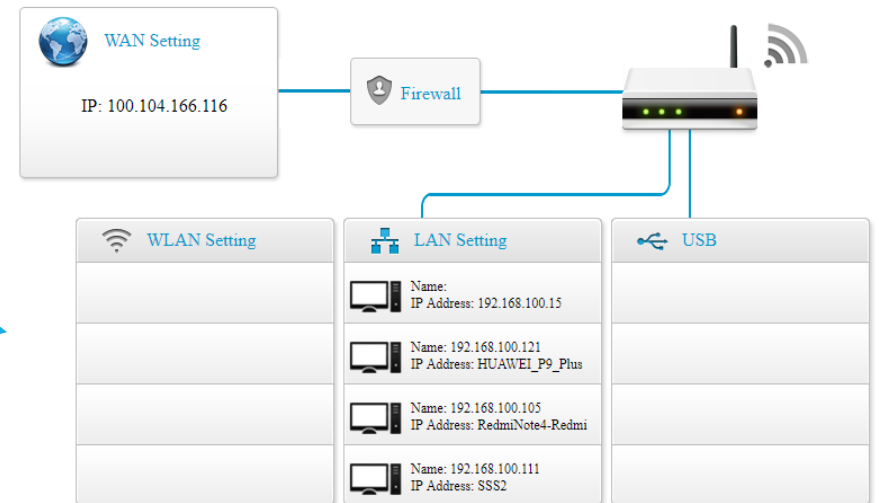
- The more Wi-Fi devices the more competition to communicate with the radio of the AP (either 2.4 GHz or 5 GHz radio)
- Distance between Wi-Fi devices also impacts communication and speed (“data rate”)





# CHECK THE CLIENT WI-FI DEVICES CONNECTED TO AP (IF THE AP SUPPORTS IT)

- Wi-Fi devices will be shown here



- Enterprise level APs can sometimes show more details about the clients

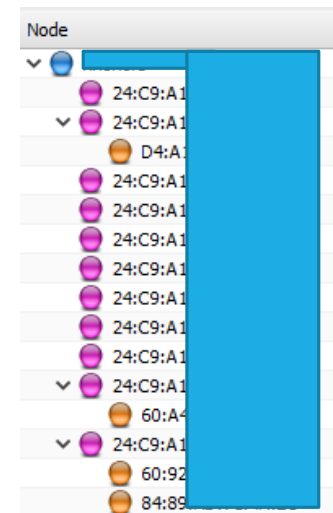
2 Networks		2 Access Points		7 Clients			
Name	Clients	Name	Clients	Name	IP Address	ESSID	Access Point
www24GHZ	0	00:0b:86:f5:ec:a6	2	DESKTOP-F7E...	192.168.100.108	www5GHZ	18:64:72:c5:3d:96
www5GHZ	7	18:64:72:c5:3d:96 *	5	HUAWEI_P9_PL...	192.168.100.121	www5GHZ	18:64:72:c5:3d:96
New				PPP8	192.168.100.106	www5GHZ	18:64:72:c5:3d:96
				RedmiNote4-R...	192.168.100.105	www5GHZ	18:64:72:c5:3d:96
				Rik-ipad	192.168.100.101	www5GHZ	00:0b:86:f5:ec:a6
				SSS2	192.168.100.111	www5GHZ	00:0b:86:f5:ec:a6

# USE A PROTOCOL ANALYZER TO VISUALIZE WHICH WI-FI CLIENT IS CONNECTED TO WHICH AP (OR WHICH RADIO INSIDE THE AP)

- Most people do not have a protocol analyzer (but if you have an Apple MacBookPro then you can use Wireshark and the built-in Wi-Fi adapter)
- Note: typically a Wi-Fi adapter in monitor mode is required (to capture the Wi-Fi frames) or an Access Point (AP) that supports to put the radio / chipset into monitor mode and the RPCAP (Remote Protocol Capture) to forward the frames to a protocol analyzer. Advanced tools can visualize exactly which client connects to which radio.

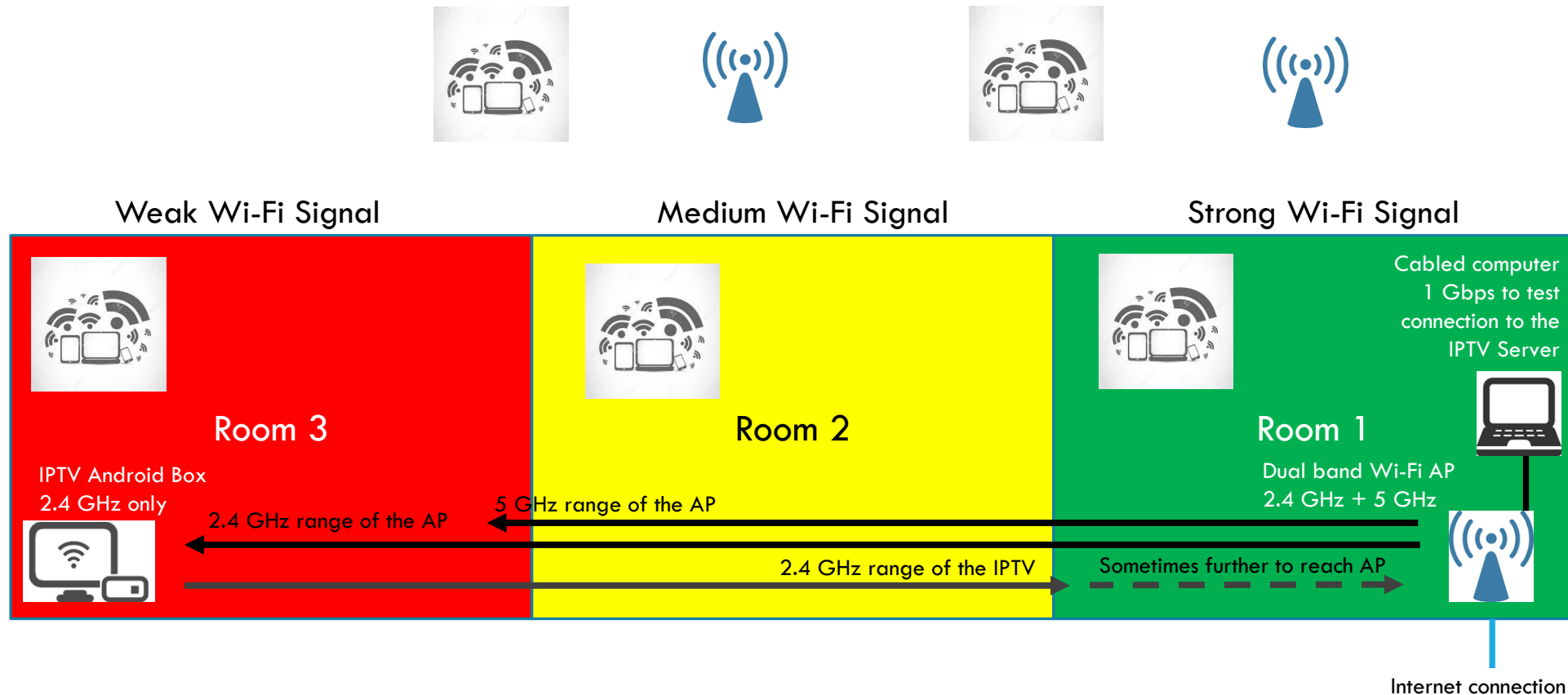
Standard / MAC Address	Channel	Type	SSID	Standard	Encryption	Signal	Max Rate	Strea...
802.11ac								
D-LinkInFC:E6:26	157 (157-161@40...)	AP	DevNet	802.11ac	WPA-CCMP	-29/-27/-23	1300.0	3
AppleBD:AD:37		STA				-43/-43/-43		
802.11an								
Cisco-Li-4A:A4:8F	48 (44-48@40)	AP	UNIT3EXT0	802.11an	WPA-CCMP	-41/-40/-39	450.0	3
Cisco79:5B:30	161 (157-161@40)	AP	DevNet	802.11an	WPA-CCMP	-59/-57/-55	300.0	2
802.11n								
Cisco:89:C6:90	2	AP	UNIT3GUEST	802.11n	WPA-CCMP	-27/-25/-23	144.0	2
Cisco:89:C6:91	2	AP	UNIT3EXT0	802.11n	WPA-CCMP	-27/-25/-23	144.0	2
Cisco:89:C6:92	2	AP	UNIT3EXT1	802.11n	WPA-CCMP	-27/-25/-23	144.0	2
Cisco:89:C6:93	2	AP	UNIT3EXT2	802.11n	WPA-CCMP	-29/-25/-23	144.0	2
D-LinkInFC:E6:24	9	AP	DevNet	802.11n	WPA-CCMP	-31/-24/-23	216.7	3
AppleBD:AD:37		STA				-39/-38/-37		
Htc:99:7A:F7		STA				-53/-34/-29		
IntelCor:AD:8F:B5		STA				-35/-30/-23		
EdimaxTe66:C2:8E	9 (5-9@40)	AP	DevNet66C2...	802.11n	WPA-CCMP	-73/-66/-61	300.0	2
NetgearD9:5A:C0	1	AP	Supernova	802.11n	WPA-TKIP	-87/-87/-85	144.0	2
Tp-LinkT:F3:0C:52	11 (7-11@40)	AP	Acc24	802.11n	WPA-CCMP...	-85/-81/-77	300.0	2
802.11g								
AsustekC:D2:AB:20	8	AP	Floor38	802.11g	WPA-CCMP	-57/-55/-47	54.0	1
AsustekC:D:C8:7C	6	AP	Floor38	802.11g	WPA-TKIP	-83/-81/-77	54.0	1
D-LinkIn:79:C4:14	11	AP	GuestNet22	802.11g	WPA-CCMP	-79/-50/-47	54.0	1

Blue = SSID = Network →  
Purple = Radio of AP →  
Orange = Client connected to the Radio →  
All purple = Radios of APs belonging to the same network (same SSID)



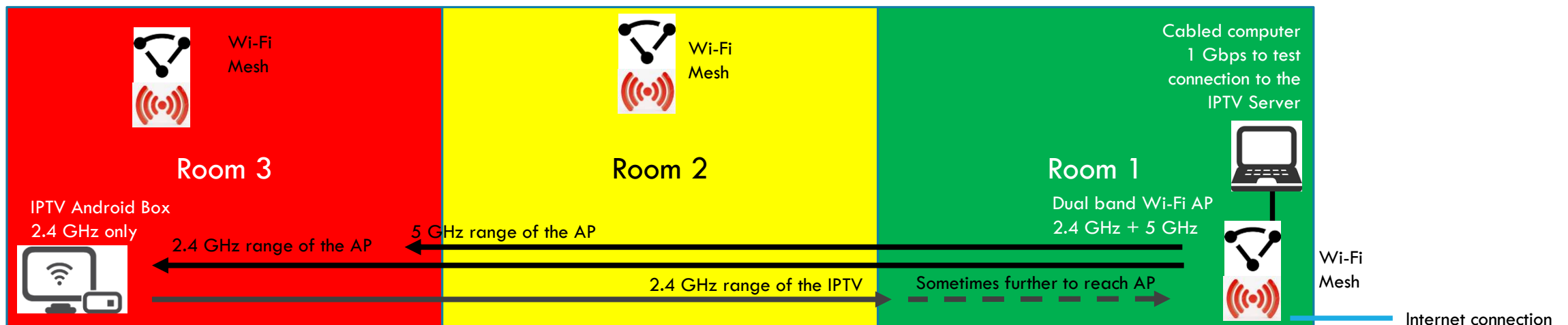
# USE A PROTOCOL ANALYZER TO UNDERSTAND HOW BUSY THE ENVIRONMENT IS WITH NEIGHBORING WI-FI DEVICES

- These devices can impact the communication if they are on the same channel as your network



# SOLUTIONS – RF COVERAGE

- If possible move the devices closer to each other (but that might not be possible)
- Install another AP closer to the IPTV box, but a data cable backhaul is required to the internet
- Wi-Fi over powerline (using electricity cabling) but it need to be on the same circuit breaker
- a Wi-Fi repeater extends the signal, but also delays the communication
- If the service provider supports a Wi-Fi Mesh AP solution then distribute mesh APs along the areas to distribute the RF signals



# SOLUTIONS

## RECONFIGURE THE WI-FI AP OF THE ISP

- The Internet Service Provider (ISP) Wi-Fi router is sometimes not stable with the firmware and configurations provided (check the log files at “debug” level if possible in the management interface).
- Sometimes turning-off services will help
  - offload as much as possible
  - turn off “multi-cast” (even it is more efficient for video-streaming)
  - turn off IPv6 addressing (on the client devices and router)
  - Turn off other unnecessary services and protocols that consume CPU and Memory and send out packets/frames over the network)
- Use the ISP-device for the internet only and as a “Router” (and turn-off the Wi-Fi radios) use another Access Point (AP), preferable an “enterprise class” AP for the Wi-Fi network

Account Management - Logs

Show Log Level:

Debug

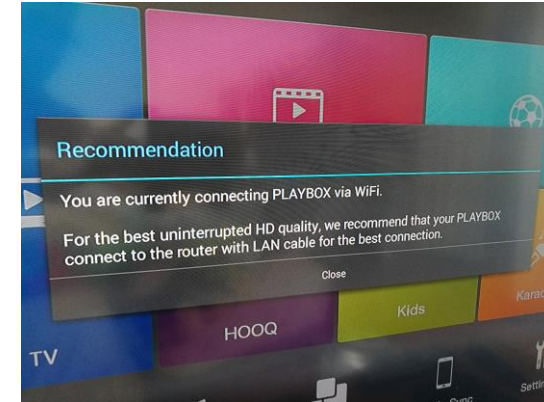
```
2017-09-26 13:48:18 [Debug] kernel: icmpv6_send: no reply to icmp error
2017-09-26 13:49:38 [Warning] kernel: iflow_id :297
2017-09-26 13:49:38 [Warning] kernel: iflow_id :299
2017-09-26 13:53:49 [Warning] kernel: ^M
2017-09-26 13:53:49 [Warning] kernel: eth0.5 phyid:0x1 status:DOWN^M
2017-09-26 13:53:50 [Debug] radvd[11035]: attempting to reread config file
2017-09-26 13:53:50 [Warning] radvd[11035]: Ignoring deprecated RDNSS open flag.
2017-09-26 13:53:50 [Debug] radvd[11035]: resuming normal operation
2017-09-26 13:53:50 [Debug] radvd[11035]: attempting to reread config file
2017-09-26 13:53:50 [Warning] radvd[11035]: Ignoring deprecated RDNSS open flag.
2017-09-26 13:53:50 [Debug] radvd[11035]: resuming normal operation
2017-09-26 13:53:50 [Informational] kernel: br0: port 4(eth0.5) entering disabled
state
2017-09-26 13:55:42 [Warning] kernel: iflow_id :297
```

# IF THERE IS NO CONNECTIVITY AT ALL

- Check if the cable from the ISP Wi-Fi router is having the proper signal strength levels to communicate back to the network hub (e.g. for xDSL or Cable Modem) and Fibre optic cable as well.
- Check if the DNS (Domain Name Server) is working to do name resolving to an IP-address (e.g. when entering [www.globeron.com](http://www.globeron.com) to map it to an IP address)
- Check if protocols work over the network and no Firewalls, Access Control Lists (ACLs) and other filters are impacting the communication.
- There are solutions in the market that can do tests using linux on a Raspberry PI device or Odroid C2 or similar (e.g. power it up using the USB-port of the IPTV box)



# EXAMPLE - SOLUTION



- While there is a warning not to use Wi-Fi for IPTV video streaming, in the example the main issue was the RF distance between the Android IPTV box and the Access Point (AP). The unnecessary services on the ISP's wireless router had to be adjusted as well that the IPTV Wi-Fi only supports 2.4 GHz (while 2.4 GHz is congested) another (Mesh) AP has been installed closer to the IPTV box.
- Actions taken:
  - Tested another normal home type AP closer to the IPTV box with a long Ethernet cable back to the Wi-Fi router (video streaming results were much better), but the cable throughout the home is not convenient
  - Used 2x spare Enterprise APs and setup a wireless mesh network connection between the rooms (2.4 GHz for access and 5 GHz for the Mesh backbone, but it is also used for 5 GHz access for other clients), turned off the Wi-Fi of the ISP's wireless router (and used it only as router for wired clients + the enterprise AP).
  - Turned off unnecessary services on the ISP wireless router (as it was causing to reset automatically every hour, in the logs there are errors related to IPv6, RDNS, Multicast, etc.)





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